



U.S. DEPARTMENT OF
ENERGY

Office of
Science

Basic Energy Sciences Update

Council for Chemical Research

Dearborn, MI

May 2, 2011

Eric A. Rohlfing, Director

Chemical Sciences, Geosciences, and Biosciences Division



U.S. DEPARTMENT OF
ENERGY

Office of
Science

Budget Updates:

FY 2011 Continuing Resolution

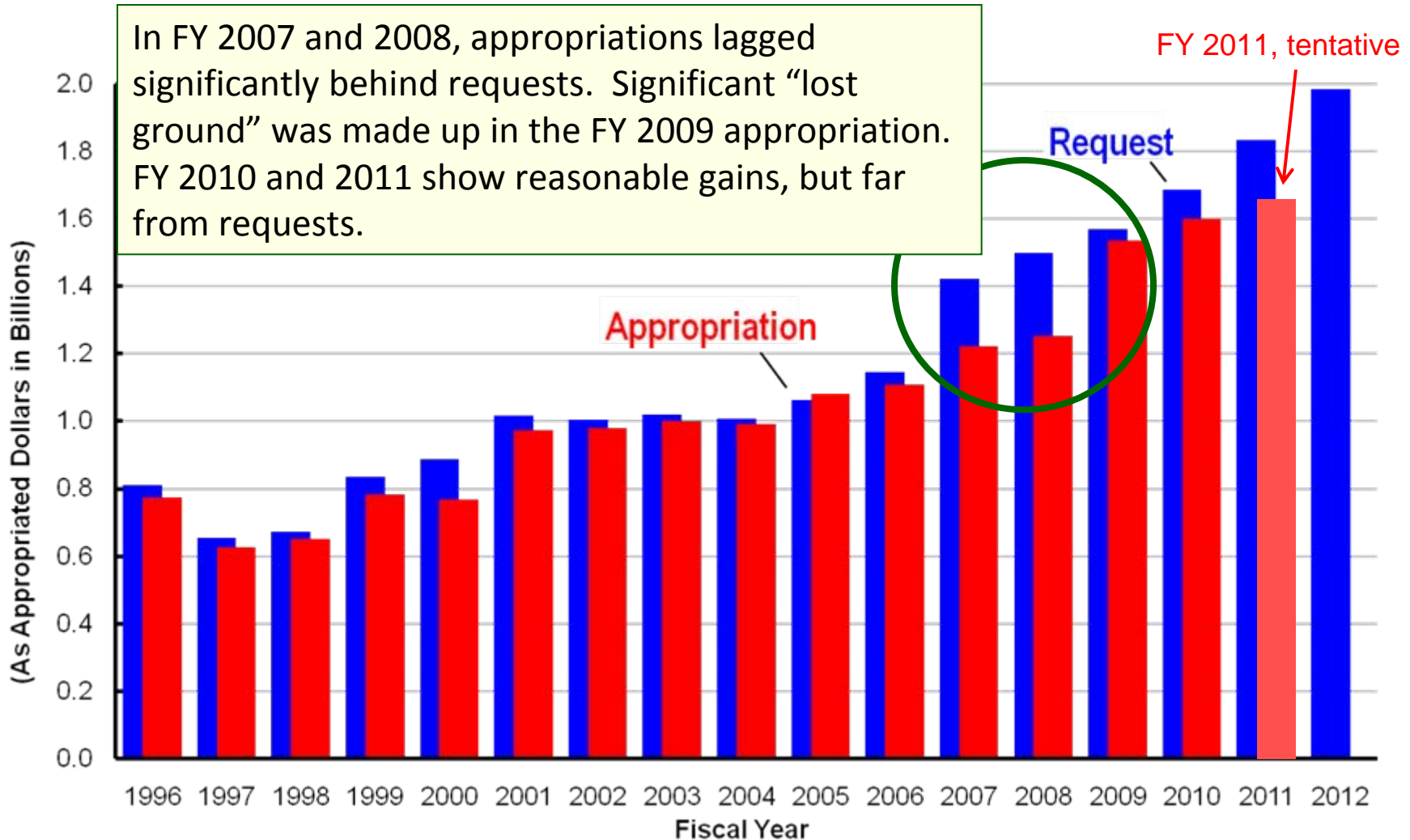
FY 2012 Request

FY 2011 Appropriation Update

- Funding for FY 2011 has (finally) been provided under H.R. 1473, the "Department of Defense and Full-Year Continuing Appropriations Act, 2011," signed into law on April 15, 2011.
- Because this is a year-long CR, each agency and office has discretion as to how funds are allocated, but must report those allocations to Congress within 30 days.
- Funding for SC is set at \$4,884M, which is a modest reduction (\$35M) from FY 2010.
- Also in SC: a 0.2% across-the-board rescission, a reduction of \$16.6M for contractor (lab) pay freezes, and a \$15M reduction for previous year uncosted balances.
- The "bottom line" for BES appears that it will be somewhat larger than the FY 2010 level.
- Things could have been much, much worse!



History of BES Request vs. Appropriation

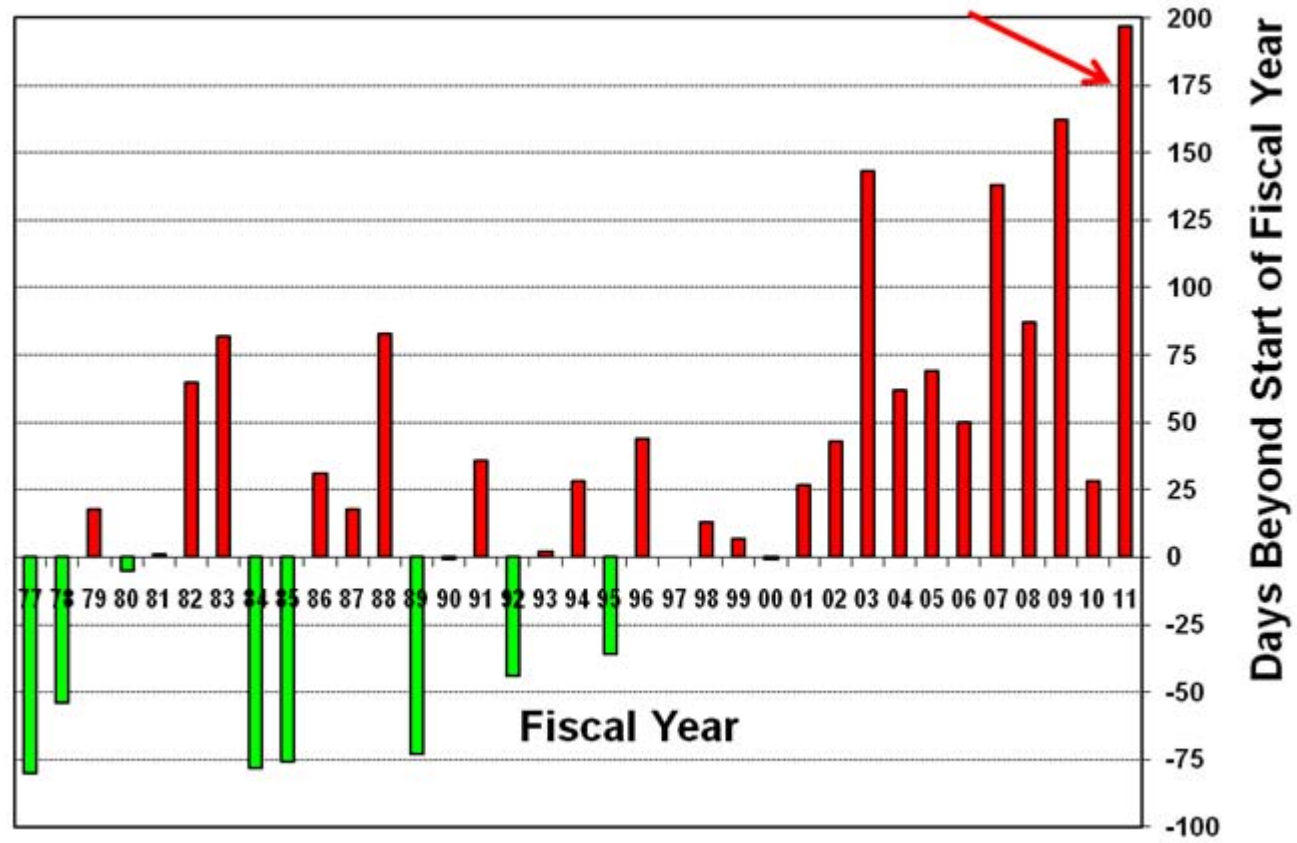


FY 2009 excludes funding from the Recovery Act.



History of the Energy and Water Development (EWD) Appropriation

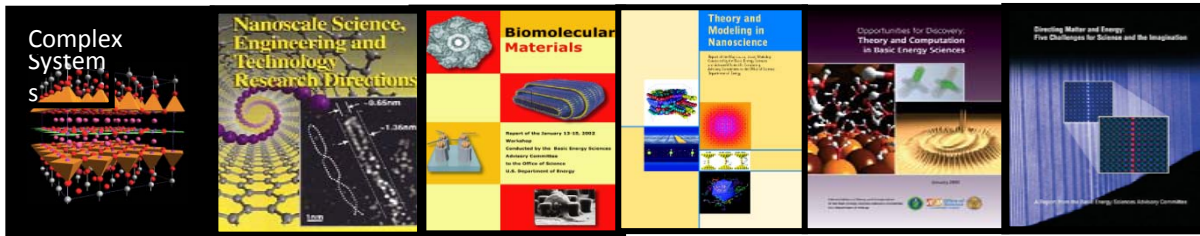
FY 2011 – a new record!



The budget uncertainty associated a significant delay in the appropriation creates havoc with agency planning.

BES Strategic Planning Activities

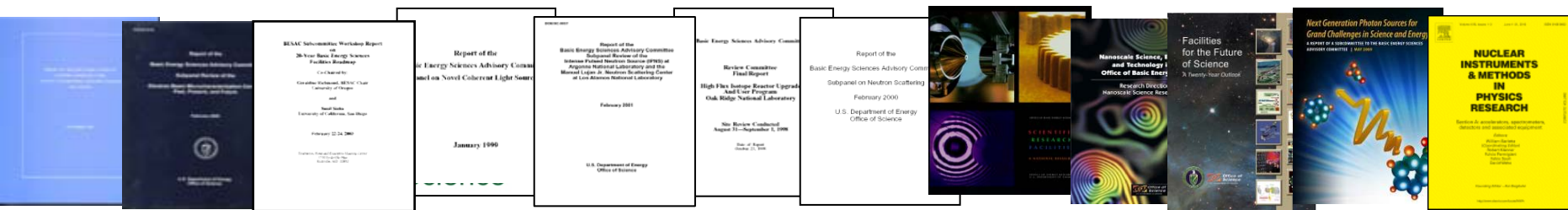
Science for Discovery



Science for National Needs

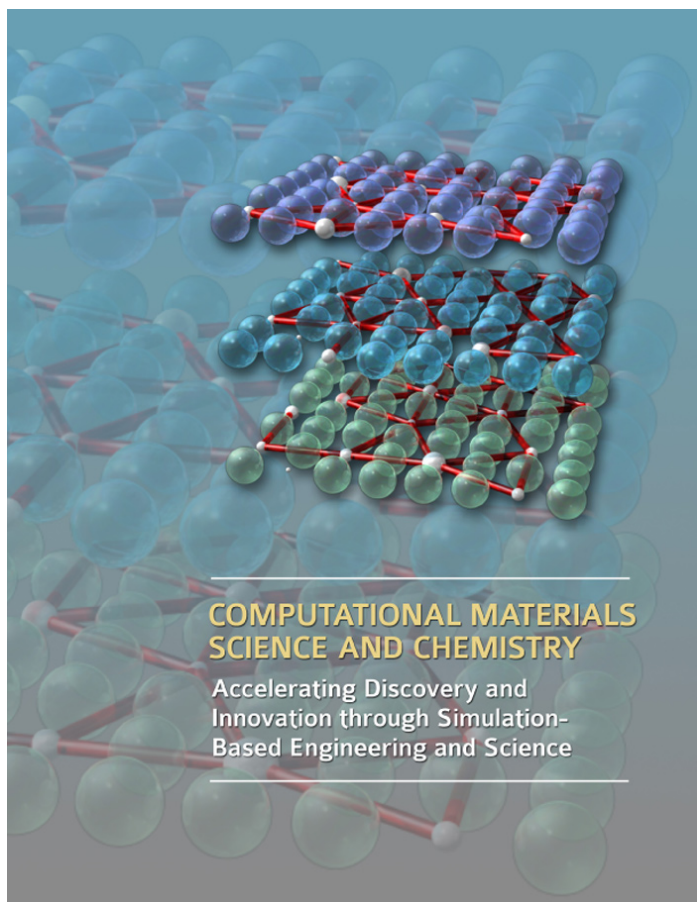


National Scientific User Facilities, the 21st century Tools of Science & Technology



Computational Materials Science and Chemistry: Creating an Innovation Ecosystem

"We are at the threshold of a new era where predictive modeling will transform our ability to design new materials and chemical processes, thereby enabling rational discovery strategies for systems that were not tractable a few years ago."

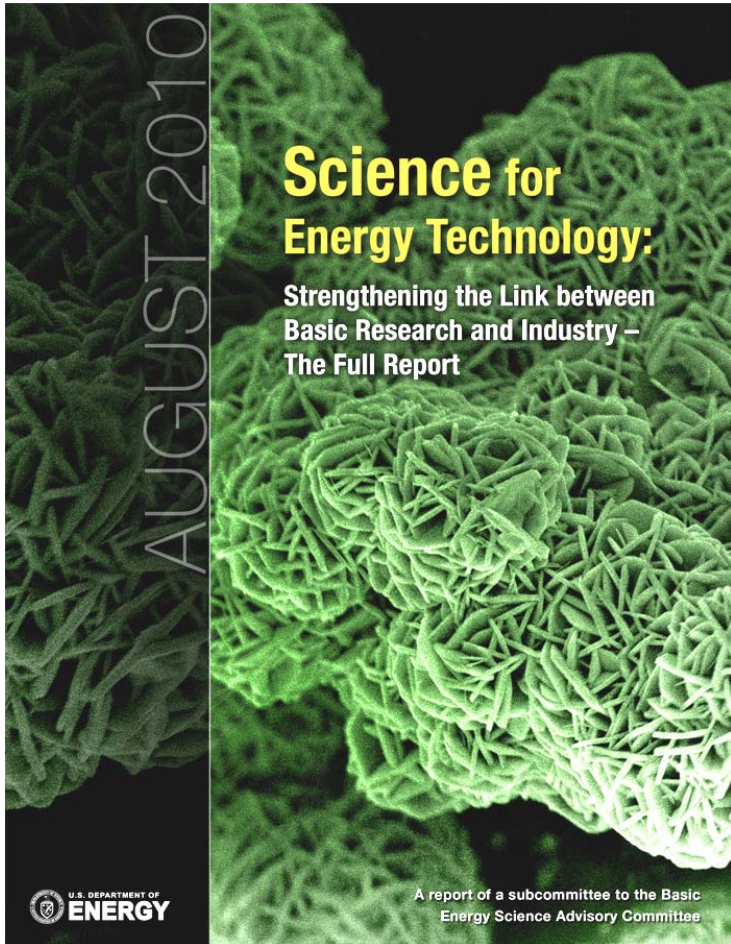


- Integration of synthesis, processing, characterization, theory, and simulation and modeling.
- Achieving/strengthening predictive capability in foundational challenge areas.
- Developing validated computational approaches that span vast differences in time and length scales.
- Experimental validation and quantification of uncertainty in simulation and modeling.
- Robust and sustainable computational infrastructure, including software and applications.
- Efficient transfer and incorporation of simulation-based engineering and science in industry.



Science for Energy Technology: Strengthening the Link Between Basic Research And Industry

9 Panels; 29 Priority Research Directions



Two kinds of science contributions:

1. “Supernovas” – breakthroughs that change technical landscape
 - High temperature superconductivity in 1986
2. Understanding and ultimately controlling existing phenomena
 - Complex materials and chemistry at the nanoscale
 - Mechanisms of “droop” in high current solid state lighting
 - Development of carbon sequestration plumes
 - Conversion among photons, electrons and chemical bonds

SciTech focused on near-term industry impact

- Emphasize sustained building of scientific knowledge base underlying technology, like Moore’s Law: series of incremental breakthroughs changes the game



U.S. DEPARTMENT OF
ENERGY

Office of
Science

FY 2012 BES Budget Request

FY 2012 Request:
\$ 1,985M

Research programs

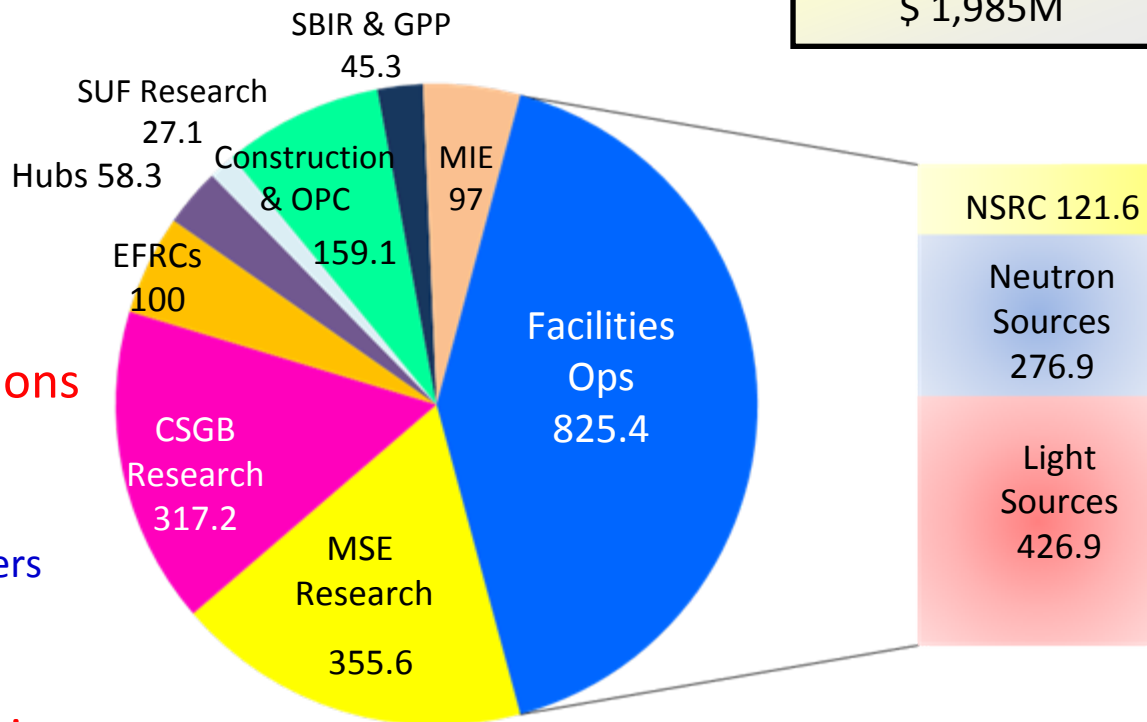
- Energy Innovation Hubs
- Energy Frontier Research Centers
- Core Research: increases in basic research for energy; materials by design; nanoelectronics; methane hydrates

Scientific user facilities operations

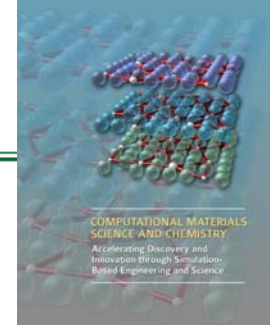
- Synchrotron light sources
- Neutron scattering facilities
- Nanoscale Science Research Centers
- Instrumentation for clean energy

Construction and instrumentation

- National Synchrotron Light Source-II and instrumentation (NEXT)
- Spallation Neutron Source instruments & upgrade
- Advanced Photon Source upgrade
- TEAM-II



Materials and Chemistry by Design

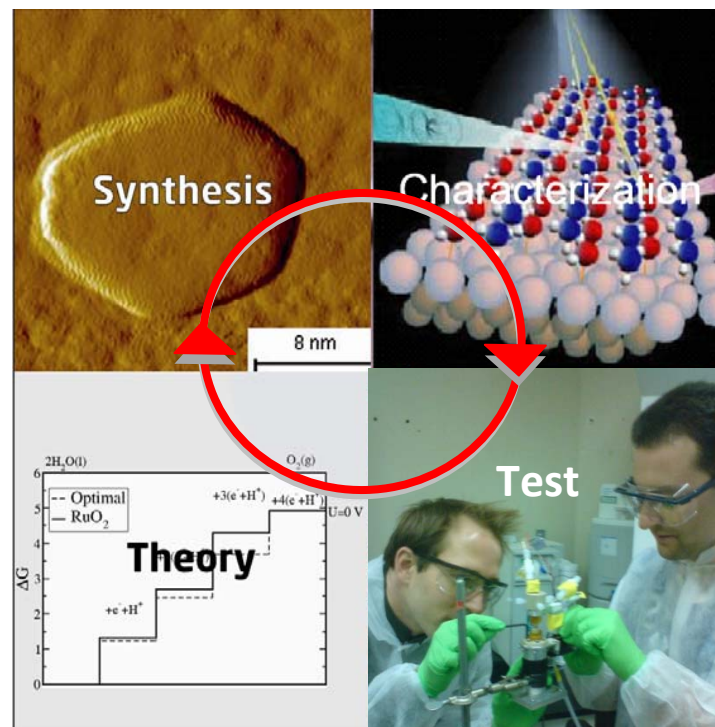


- Research to establish materials design rules to launch an era of predictive modeling, changing the paradigm of materials discovery from serendipity to rational design.
- Discovery of new materials has been the engine driving science frontiers and fueling technology innovations. The U.S. has the world's most powerful suite of tools for materials synthesis, characterization, and computation.
- \$40M request to support the following research focus:

Synthesis: Rational molecular-scale design guided by simulation.

Characterization and Testing: Verify & validate computational designs and software, including in situ measurements using x-ray, neutron, microscopy, and nanoscience facilities.

Theory/Simulation: New methods and algorithms for complex, multi-scale systems. Development of software and toolkits through a networked, broad community. Emphasis areas include: catalysis, light-weight materials, and materials for energy applications including radiation-resistant materials, carbon capture, batteries, liquid fuels, and photocatalysis.

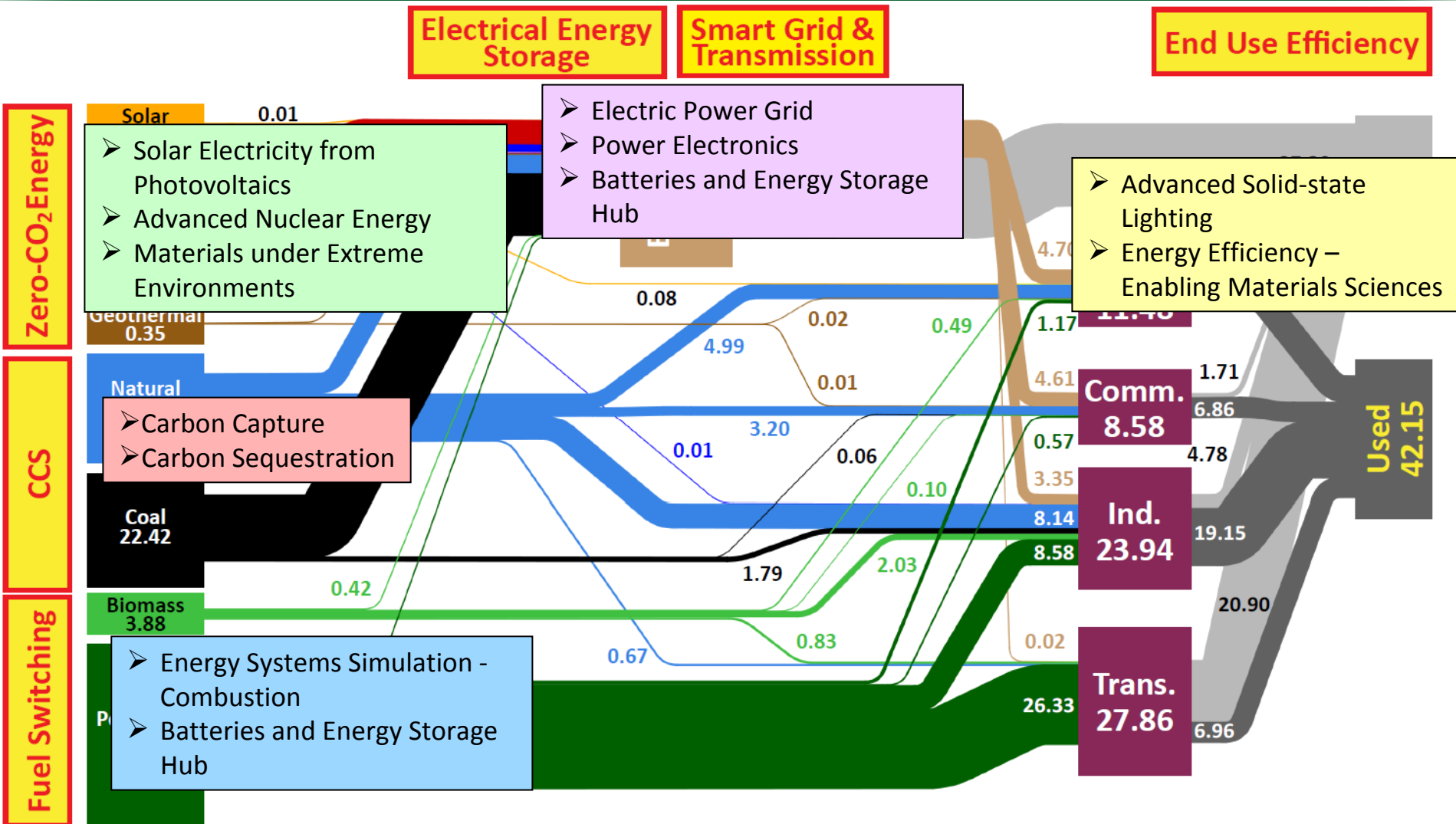


FY12 Budget Request: Science for Energy

<i>Non-carbon Sources</i>	(Dollars in thousands)
Solar Electricity from Photovoltaics	+ 8,000
Advanced Nuclear Energy Systems	+ 8,000
Materials under Extreme Environments	+15,000
<i>Carbon Capture and Sequestration</i>	
Carbon Capture	+ 8,000
Carbon Sequestration	+ 8,000
<i>Transportation and Fuel Switching</i>	
Energy Systems Simulation - Combustion	+ 15,000
Batteries and Energy Storage Hub	+ 34,020
<i>Transmission and Energy Storage</i>	
Electric Power Grid-Enabling Materials Sciences	+ 4,000
Power Electronics	+ 3,500
Batteries and Energy Storage Hub	(same as above)
<i>Efficiency</i>	
Advanced Solid-state Lighting	+ 8,000
Energy Efficiency – Enabling Materials Sciences	+ 4,000

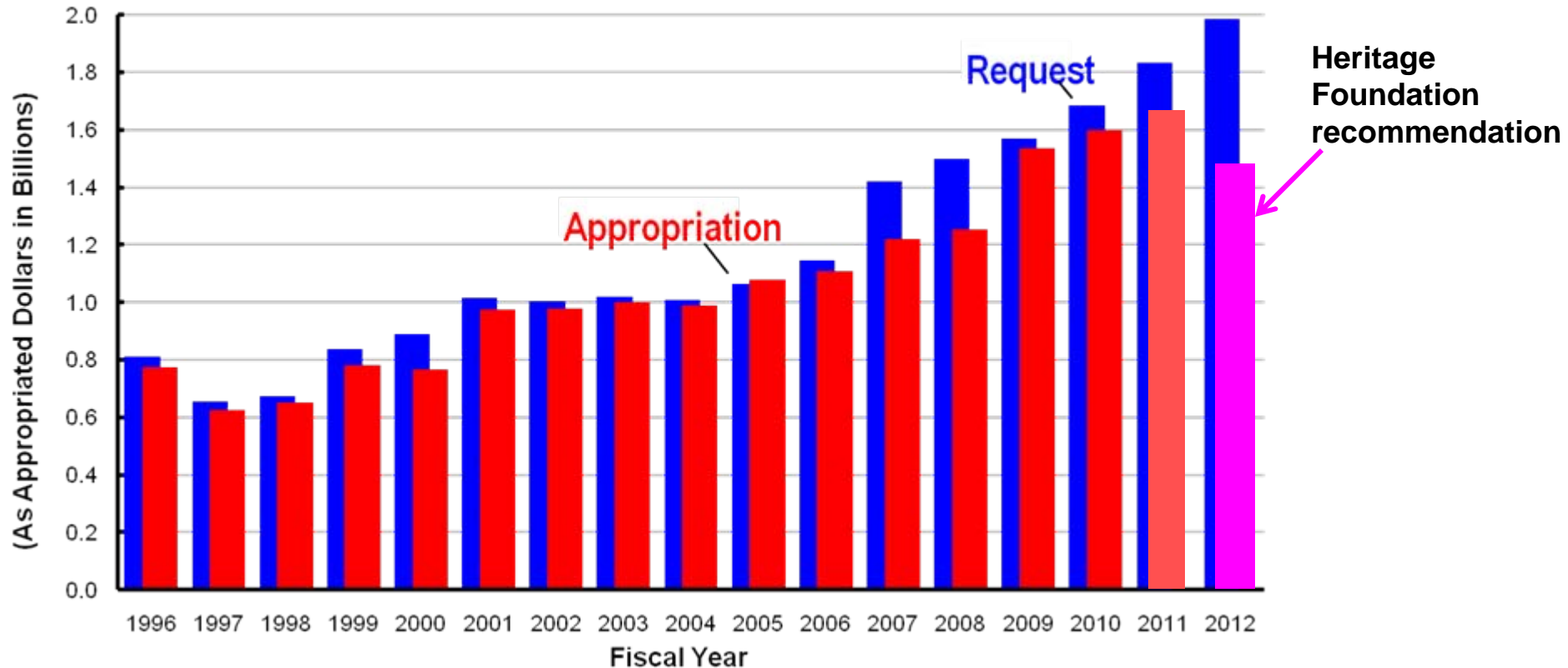


FY 12 Budget Request : A National Strategy for a New Energy Economy



Source: Lawrence Livermore National Laboratory and the Department of Energy, Energy Information Administration, 2009 (based on data from DOE/EIA-0384(2008), June 2009).

Preface to the FY 2012 Budget Battle



Heritage Foundation recommends cutting BES budget by \$506M from the FY 2012 request and eliminating the “many BES programs that stray from fundamental research to commercialization.”*





U.S. DEPARTMENT OF
ENERGY

Office of
Science

Thank you!